

## Flexible Gap Filler for Ablative Thermal Protection Systems, Phase I

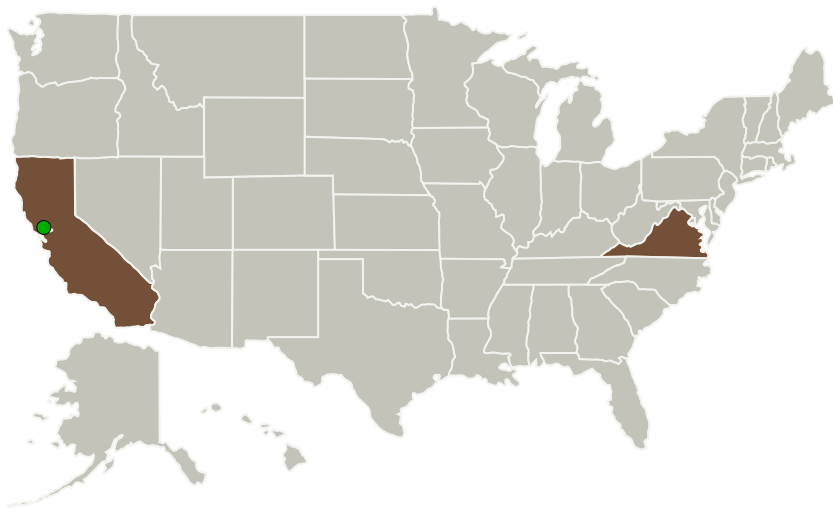
Completed Technology Project (2016 - 2016)



## Project Introduction

NASA's Orion spacecraft will serve as the exploration vehicle that will carry a crew to space, provide emergency abort capability, sustain the crew during the space travel, and provide safe re-entry from deep space return velocities. Planetary aerocapture and entry requires that the crew vehicle be equipped with a Thermal Protection System (TPS) comprised of lightweight, high performance ablator materials. Materials current under development include felt or woven material precursors impregnated with polymers (i.e. PICA) and/or additives to improve ablation and insulative performance, along with the block form of Avcoat ablator. There is a need for advancements in polymers for use in bonding and/or gap fills for tiles of advanced TPS for extreme entry conditions. The ideal binder would be a flexible, low glass transition temperature polymer with a high decomposition temperature/char yield (comparable to phenolic) and a high (>1%) strain-to-failure that is compatible with cured epoxy, phenolic, and/or cyanate ester. Engineers at Luna have developed a novel copolymer elastomer that has a very low glass transition (< -100 degrees F) and a decomposition temperature on par with typical phenolic ablative. This resin can be highly filled to tune ablative properties and is compatible with glass and carbon fabric substrates.

## Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Luna Innovations, Inc.	Lead Organization	Industry	Roanoke, Virginia
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Virginia

## Project Transitions

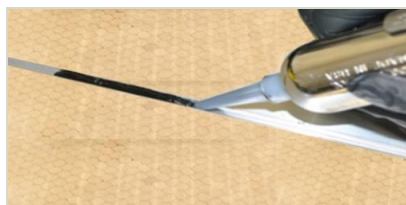
▶ **June 2016:** Project Start

✓ **December 2016:** Closed out

## Closeout Documentation:

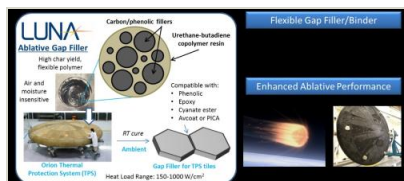
- Final Summary Chart(<https://techport.nasa.gov/file/139732>)

## Images



## Briefing Chart Image

Flexible Gap Filler for Ablative Thermal Protection Systems, Phase I  
(<https://techport.nasa.gov/image/131503>)



## Final Summary Chart Image

Flexible Gap Filler for Ablative Thermal Protection Systems, Phase I Project Image  
(<https://techport.nasa.gov/image/125912>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

Luna Innovations, Inc.

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

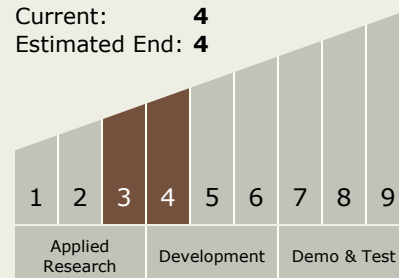
Carlos Torrez

## Principal Investigator:

Benjamin Beck

## Technology Maturity (TRL)

Start: 3  
Current: 4  
Estimated End: 4



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## Technology Areas

### Primary:

- TX09 Entry, Descent, and Landing
  - └ TX09.1 Aeroassist and Atmospheric Entry
    - └ TX09.1.1 Thermal Protection Systems

## Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System